

Acid and base

# Solutions

- When a substance dissolves in water, a solution is produced. A solution is a homogenous mixture.
- A solution can be classified into (1) acidic (2) basic (3) neutral

# General properties of acid

- Taste sour
- Turn blue litmus paper red
- pH value less than 7
- Corrosive
- Conduct electricity
- React with metals, carbonates and bases/alkalis

- Acid react with metals to produce salt and hydrogen. Acid + metal  $\rightarrow$  salt + hydrogen
- A lighted splint is used to test for hydrogen gas produced. If hydrogen is present, (1) 'pop' sound is produced (2) lighted splint extinguishes.
- Nitric acid  $\rightarrow$  nitrate salt.
- Sulfuric acid  $\rightarrow$  sulfate salt
- Hydrochloric acid  $\rightarrow$  chloride salt

- Nitric acid + magnesium → magnesium nitrate + hydrogen
- Sulfuric acid + sodium → sodium sulfate + hydrogen
- Hydrochloric acid + calcium → calcium chloride + hydrogen

- Acid + carbonate → salt + water + carbon dioxide
- Nitric acid + sodium carbonate → sodium nitrate + water + carbon dioxide
- Hydrochloric acid + calcium carbonate → calcium chloride + water + carbon dioxide
- Limewater (calcium hydroxide) is used to test for carbon dioxide produced from the reaction. Carbon dioxide will turn limewater cloudy/chalky/milky

- Acids react with bases or alkalis to form salt and water. This reaction is called neutralization reaction.
- The solution formed is neutral.
- Acid + base/alkali  $\rightarrow$  salt + water

Example

- ❖ nitric acid + calcium oxide  $\rightarrow$  calcium nitrate + water
- ❖ Sulfuric acid + lithium hydroxide  $\rightarrow$  lithium sulfate + water
- ❖ Hydrochloric acid + zinc oxide  $\rightarrow$  zinc chloride + water

# Bases

- Bases are compounds formed between metals and oxygen, so they are oxides of metals.
- Most of the bases cannot dissolve in water. However, when a base is able to dissolve in water, it will form an alkali. An alkali is a soluble base. E.g. sodium oxide (base) dissolve in water to form sodium hydroxide (alkali)
- Alkalis can be found in soaps, detergents, window cleaners and indigestion tablets.



# Common bases and alkalis

Bases	Alkalis
<ul style="list-style-type: none"><li>• Sodium oxide</li><li>• Copper oxide</li><li>• Zinc oxide</li></ul>	Sodium hydroxide Potassium hydroxide Lithium hydroxide Ammonium hydroxide

# General properties of alkalis

- Bitter taste
- Slippery or soapy
- Turn red litmus paper blue
- Corrosive
- Conduct electricity
- React with acid to produce salt and water (neutralization)

# pH scale

- pH scale is numbered between 0 to 14. It measures how acidic or alkali a solution is in water.
- Acids have pH values less than 7. The smaller the pH value, the stronger the acid is.
- Alkalis have pH values more than 7. The greater the pH value, the stronger the alkali is

# Indicators

- Indicators are chemical substances which change colors when they come in contact with acids or alkalis.
- They let us know whether a solution is acidic, neutral or alkaline.
- Example of indicators: litmus paper, phenolphthalein, methyl orange and bromophenol blue